where E_1 is the potential developed between the set **37** of diodes and the point **2**; E_2 is the potential developed between the point **2** and the set **35** of diodes; E_3 is the value of potential applied by the source **40**; R_1 and R_2 are respectively the values of resistance presented between the point **2** and the sets **37** and **35** of diodes; R_3 is the total resistance across the X coordinate of the layers **16**; X_1 and X_2 are the lengths of the coordinates along the X direction of the layer **16** between the points of connection of the diodes and the point **2**; and X_3 is the entire dimension along the vertical or X coordinate of the layer **16**. Since the values of X_3 and E_3 are known and constant, and the potential E_1 is that potential applied to the layer **22** and may be measured by an X, Y position indicating circuit **42**, the values of X_1 and X_2 can be likewise measured by the circuit **42**. In order to measure the value of the coordinates Y_1 and Y_2, the potential applied between the conductive members **33** and **39** is reversed and the current will now flow between the sets **34** and **36** of diodes along the Y coordinates of the layer **16**. The equations given above also apply to define the Y coordinates of the position of the points **1** and **2** of contact between the layers **22** and **16**. If the X coordinate signal is stored while obtaining a Y coordinate and vice versa, a continuous output of the coordinates of the point **1** (and **2**) of contact will be available. The source **40** may be set at a rate which is fast enough that if the layer **16** is approximately 10 inches square, a person moving his hand across the layer **22** cannot change the point of contact more than 0.1% of the X or Y dimension in a millisecond. The potential signals corresponding to the X and Y coordinates of the point of contacts of the layers **22** and **16** is applied to the X, Y position indicating circuit **42** which measures the potential derived from the layer **22** to indicate one of the coordinates of the point of contact. During the next half cycle of the AC potential source **40**, the X, Y position indicating circuit **42** measures the other coordinate of the point of contact. Illustratively, the developed analog coordinate signals may be converted by the circuit **42** to digital signals which may be processed by the storage system **44**. A further description of an illustrative embodiment of the circuit **42** is found in an article entitled "'Light-Pen' Facilities for Direct View Use Storage Tubes—Economical Solution for Multiple Man-Machine Combination" by G. A. Rose, IEEE Transactions on electronic computers, pp. 637–639, August 1965.

In operation, a series of informational bits may be presented by projecting images of the transparencies **50** onto the interface device **10**. After the information has been presented, a transparency **50** will be selected that will ask for a response by the student. The student will reply by pressing a particular portion of the interface device **10**. As explained above, a potential will be developed upon the layer **16** indicating the coordinates of the point depressed by the student and thus his answer. The X, Y position indicating circuit **42** will provide an output signal indicating the coordinates of the point contact between the layers **22** and **16** and will apply this signal to the computer storage system **44**. The computer storage system **44** functions to evaluate the answer of the student. If the student responded correctly, the projector will be activated to present a new series of transparencies **50** to the student. If the student responded incorrectly, the computer storage system **44** will control the projector **46** to redisplay the transparency **50** or to display remedial information.

Another possible use for the interface device described above is to replace the standard typewriter keyboard now used in teaching machines. The typewriter keyboard of the present art has several undesirable features. The first is the inability to change the keyboard format. The designation of the keys can be changed but the positions cannot. The second undesirable feature is the audible mechanical noise present when the keys are touched. A louder noise is produced when the keyboard is cleared.

After a key is selected, the keyboard locks the keys into a set position in order to prevent another key selection while the computer is evaluating the first response. When the computer is ready to receive another key selection, the computer signals a clear operation to the keyboard. This produces a very audible noise in the keyboard as it is cleared. This noise is a clue to the student that the keyboard is active and it is undesirable when using certain psychology experiments. In order to use the interface device as a keyboard, an appropriate templet is disposed behind the base support member **12** with regard to the student. The templet is visible through the transparent members of the interface device **10** and serves to define the various positions of the interface device. The student will hear no clicks or other key noises unless some audible signal is provided. This external audio signal can be controlled, whereas the sounds of the normal keyboard cannot.

Thus, there has been described an interface device that does not give off audible sounds which may clue the student or undesirably effect his response. Further, the interface device of this invention is capable of a greater resolution than will normally be required. The diameter of the finger of the user limits the usable resolution and is larger than the resolution of which this device is capable. More specifically the linearity of the layer **16** of resistive material is approximately 2%. Effectively, the layer **16** of resistive material limits the resolution to approximately .24 inch for a 12 inch square device. However, such resolution is more than adequate to provide a 16 x 16 array of discrete selectable points.

Since numerous changes may be made in the above described apparatus and different embodiments of the invention may be made without departing from the spirit thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings, shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An interface device comprising:

a first layer having a uniform resistance per unit of measurement;

a second layer having a conductive surface disposed thereon toward said first layer and comprising a continuous, electrically conductive material,

said first and second layers being both transmissive to visible radiation,

a spacer disposed between said first and second layers for normally keeping said layers out of electrical contact with one another,

said second layer being flexible so as to make electrical contact to said first layer at a point where depressed;

a first plurality of electrical conductors respectively disposed in spaced relationship along opposite sides of said first layer in electrical contact therewith;

a second plurality of electrical conductors respectively disposed in spaced relationship along the other pair of opposite sides of said first layers in electrical contact therewith;

said first and second pluralities of electrical conductors forming a matrix with said first layer so that respective coordinate positions may be established;

supply means for respectively applying current to said first and second pairs of conductors; and

indication means operatively connected to said second layer for respectively indicating the coordinate position where said second layer is depressed to make electrical contact with said first layer.

2. An interface device as claimed in claim **1**, wherein a set of indicia is disposed to be visible through said first and second layers to thereby define various portions of said interface device.

3. A teaching system including the interface device of claim **1**, and means for projecting images upon said in-